II. "The Electrical Measurement of Starlight. Observations made at the Observatory of Daramona House, co. Westmeath, in January, 1896. Second Report." By G. M. MINCHIN, M.A., F.R.S., Professor of Mathematics, Cooper's Hill College. Received January 23, 1896.

In the 'Proceedings of the Royal Society,' vol. 58, pp. 142, &c., will be found the first account of the measurement of stellar radiation by means of the electromotive force generated by the action of starlight on my photo-electric cells. The observations were resumed in the beginning of January, 1896, in Mr. W. E. Wilson's observatory by the same three observers—namely, Mr. Wilson, Professor Fitzgerald, and myself.

Our appliances were substantially the same as before; but the photo-electric cells had in the meantime been rendered markedly more sensitive by the prevention of the ascent of the liquid (œnanthol) into the glass tube containing the aluminium wire, the end of which was coated with the selenium layer on which the light was received.

This ascent of the liquid was prevented by simply painting the circle of contact of the wire and tube with liquid gelatine, and allowing the gelatine ring thus formed to dry. As gelatine is not dissolved by œnanthol, the liquid was in this way kept out of contact with the aluminium wire, and the result was a great increase in the sensitiveness and lasting power of the cell.

It is to be regretted that out of the fourteen nights at our disposal for work, only *one* proved favourable for observations; but even on this night we were obliged to omit observations on such bright stars as Sirius, Rigel, and Capella, owing to the persistence of haze in the atmosphere.

The aim of our work on this occasion was to measure the candle power of the light of each of the stars in Orion and the Great Bear, together with that of as many others as spare time would allow us to observe.

As one cell may not be exactly the same in sensitiveness as another, I have set down in the following table the value of the light of each star in terms of that of a standard candle held at a distance of 10 ft. from the sensitive surface in the cell; but the value of the light in volts is easily deduced from the data.

The electrometer employed was that previously used and described; and it continued to give with remarkable constancy a deflection of 630 mm. on a scale distant 7 ft. from the mirror for one Leclanché cell, or, say, 432 mm. for 1 volt.

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Observations made in January, 1896.

Source of light.	Deflection on scale, in millimetres.	Value of light, in terms of standard candle.
Candle, at 10 feet	18·70	—
Jupiter	61·20	3·272
Betelgeuse	12·80	0·685
ζ Orionis (lowest in belt)	3·17	0·170
ε Orionis (middle in belt)	3·29	0·175
Aldebaran	5·21	0·279
η Ursæ Majoris (last in tail)	5 07	0·271
Procyon	4·87	0·261
α Cygni	4·90	0·262
Pole Star	3·10	0·166
Pointer next Pole	2·20	0·117
β Ursæ Minoris	2·44	0·130

One observation was attempted for Rigel; but when a deflection of 8 mm. had been attained, the light was cut off by clouds, and no further opportunity occurred.

With regard to the last column in this table, be it understood that it gives *the ratio of the E.M.F. produced by the light of the star as concentrated in a telescope of* 2 *ft. aperture to the E.M.F. produced by the light of the candle falling directly on the cell from a distance of* 10 *ft.*

In order to determine the candle value of any star, we must, of course, take into account the area of the telescope aperture, the area of the sensitive selenium surface in the cell, the distance of the star from the earth, and the distance of the candle from the cell.

Thus, if I = intrinsic brightness of a star (*i.e.*, the total amount of energy radiated in all directions by the star per unit time)

i = intrinsic brightness of candle,
A = diameter of aperture of telescope,
a = diameter of selenium surface,
R = distance of star,
r = distance of candle,
e = deflection on electrometer scale due to star,
E = deflection on electrometer scale due to candle,

we have

$$\frac{\mathrm{I}}{i} = \left(\frac{a \,.\, \mathrm{R} \,.\, e}{\mathrm{A} \,.\, r \,.\, \mathrm{E}}\right)^2 .$$

For example, selecting the star Procyon in the above list as that whose parallax is best known, we find (see Miss Clerke's 'System of the Stars') the value 0 266 second for the parallax. Also the diameter, a, of the sensitive surface was about $\frac{1}{20}$ in., while A was 2 ft., so that $a/A = 1/480$; hence we have (*q.p.*)—

$$I/i = 516 \times 10^{24},$$

that is, Procyon is equivalent to about 516 billions of billions of standard candles.

We cannot help being struck by the enormous power of Betelgeuse as indicated in the table. The deflection observed was the mean of *five*, all very fairly close. Now the only parallax recorded for this star, so far as I can ascertain, is a *negative* one! The star is, therefore, immeasurably distant, and yet the E.M.F. of its light is very great; hence it must be possessed of tremendous energy.

We hope that our next observations will be taken with still better appliances, as Mr. Wilson has suggested a great improvement in the cell-carrying apparatus, which will enable us to see simply and with certainty when the light of the star is falling exactly on the sensitive selenium surface.

III. "Contributions to the Chemistry of Chlorophyll. No. VII. Phylloporphyrin and Hæmatoporphyrin: a Comparison." By EDWARD SCHUNCK, F.R.S., and LEON MARCHLEWSKI, Ph.D. Received January 23, 1896.

In the memoir on the Chemistry of Chlorophyll immediately preceding this one, we described a derivative of chlorophyll, the analysis of which, confirmed by that of its zinc salt, led to the formula $C_{32}H_{34}N_4O_2$. This substance being probably in the main identical with the phylloporphyrin of previous observers, we saw no reason to give it another name.

Recent investigations of the colouring matter of blood, more especially that of Nencki and Sieber, have shown that to the anhydride of hæmatoporphyrin, a derivative of hæmoglobin, the formula $C_{32}H_{34}N_4O_5$ is to be ascribed. This formula differs from that of phylloporphyrin simply by three atoms more of O. But the resemblance between the two substances is not confined to the approximation of their formulæ; it extends also to several of their physical properties, such as the colour of their solutions, but more especially the appearance of these solutions before the spectroscope, which is so nearly alike, so far as the absorption spectra are concerned, that not knowing their wide difference in other respects we might be inclined to consider them as identical. That the two series of derivatives, that of chlorophyll and that of hæmoglobin, each playing an important part in the vegetable and animal organism respectively, should so nearly touch at one point is certainly a remarkable circumstance. In